C1850-2 A

SIX DOLLARS

A CAHNERS PUBLICATION

Electronic Business®

FOR MANAGEMENT IN ELECTRONICS, COMPUTER & SYSTEMS COMPANIES — WORLDWIDE

JANUARY 8, 1990

INSIDE ZENITH'S HDTV STRATEGY

Last stand battle for a U.S. standard

PAGE 24

Robert Hansen, Zenith Electronics' consumer products president

Outlook 1990: No gains, no recession

PAGE 58

Stalking elusive venture capital

PAGE 72

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES—WORLDWIDE

VOL. 16, NO. 1 JANUARY 8, 1990

PAGE 24 Zenith's consumer president Robert Hansen: Seeking to parent the U.S. HDTV standard

Cover photograph: Marc Berlow

COVER STORY/MANAGING TECHNOLOGY

24 HDTV: Who will win the battle to set U.S. standards?

The U.S. electronics industry's push for an Apollo-like program for high-definition systems is hitting a stone wall. Meanwhile, national programs in Japan and Europe are girding for world markets that will make many of today's electronic technologies obsolete. Without governmental support, some say, the U.S. electronics industry could lose its last remaining outpost in consumer electronics. Undaunted by this lack of support, though, is Zenith, which is moving ahead with its own R&D effort.

BUSINESS TRENDS

17 Distributed computing: A blessing for mainframes

Despite predictions that distributed computing will soon send mainframes the way of dinosaurs, the growth of computer networks could actually spur sales of mainframes for specialized tasks. In adjusting to the new atmosphere, mainframe vendors will have to modify their product, marketing and service strategies to keep up.

MANAGING TECHNOLOGY

24 HDTV: Who will win the battle to set U.S. standards?

Supporters of a national U.S. program to spur high-definition systems stress that HDTV stakes are vastly more complex than simply building a new U.S. market for U.S.-made TV sets. The technology is seen as a priceless opportunity for the United States both to get back into the world consumer-electronics race and to retain global competitiveness with a wide range of other electronics products.

26 Zenith's HDTV strategy: "Made in the USA"

Zenith, having sold off its profitable computer systems unit, is moving ahead with HDTV. Company execs give ELECTRONIC BUSINESS an exclusive look at the reasons for the sale and explain their strategy for parenting a high-definition standard for the United States.

30 What makes Japan's HDTV projects click?

Opponents of government-backed U.S. collaborative programs argue that such efforts are wasteful and ineffective. So why have such efforts been so successful in Japan?

STRATEGIES

47 Teradyne: Yankee conservative makes its hunches pay off

Thanks to an insistence on diversifying its operations and a penchant for making intelligent — but risky — guesses pay off, Boston-based Teradyne is emerging as America's best bet in ATE.

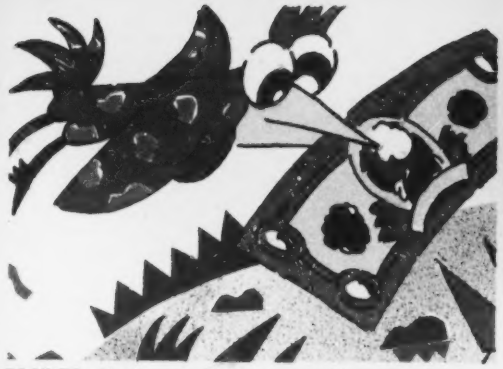
1990 OUTLOOK

58 No crash landing for economy this year

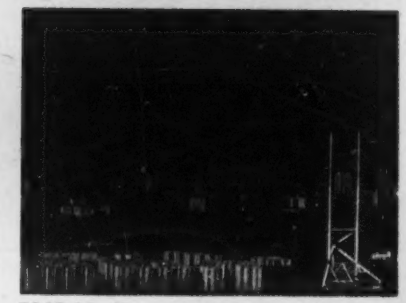
If the Federal Reserve Board can call the right shots and if the dollar behaves itself, the economy will get its long-awaited soft landing in 1990. And thanks to that gentle fall, the dreaded recession predicted by several doomsayers will be averted until 1991 or perhaps even 1992. All in all, 1990 will be a lackluster year for the economy.

60 Economy drifts down; electronics markets follow

Although it may not have been true in the 1980s, as the economy goes this year, so goes electronics. With a slowing of GNP growth in 1990, expect a similar slowdown in the electronics industry growth rate. The good news is that, put into perspective, the slowdown doesn't look nearly as bad as the 1985-86 industry recession.

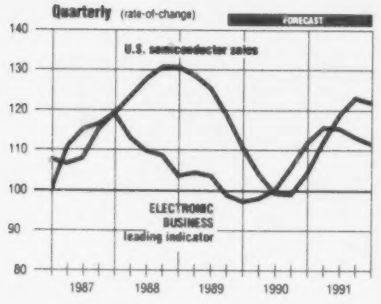


PAGE 72 Venture capitalists nourishing only the best and brightest



PAGE 89 Nervousness in Hong Kong as 1997 approaches

PAGE 47 Teradyne's Alex d'Arbeloff: Yankee ingenuity and sensible risk taking are paying off



PAGE 105 Business Barometer: Profits index takes a turn for the worse

PAGE 81 Robert Bosch's Marcus Bierich: "Our growth in the future will come outside Germany"

PAGE 58 No crash landing for economy this year

MANAGING RESOURCES

72 Venture capitalists nourishing only the best and brightest

Venture capitalists over the past year and a half have become highly selective in feeding funds to early-stage high-tech projects. To raise seed money, technology entrepreneurs must supply innovative products directed at solving specific customer problems; it also helps to hit the ground running. "Everybody in this business has grown more cautious," one financial analyst reports.

EUROPE BUSINESS

81 As Bosch gets tougher, will customers get going?

With the dramatic increase in the value of automotive electronics for new cars, rivals are redoubling sales efforts, and Bosch, the world's top supplier of such electronic parts, is moving aggressively to solidify its position. The West German company is enhancing its U.S. presence and improving its responsiveness to customer needs.

ASIA/PACIFIC BUSINESS

89 Hong Kong's electronics leaders run scared as 1997 approaches

Electronics companies that assemble and manufacture in Hong Kong are busily considering their strategies for when the People's Republic of China reclaims the territory from British control in 1997. One of the biggest uncertainties is whether the conservative government in China will allow Hong Kong's thriving free market economy to continue.

BUSINESS BAROMETER

105 Revenue and profits

The ELECTRONIC BUSINESS profit index took a turn for the worse in the third quarter of 1989, setting the stage for an expected 2.5% decline in profits by the end of the year.

106 Leading indicator

Expect a short and shallow downturn to materialize in mid-1990 for semiconductors and by late 1990 for electronics equipment.

DEPARTMENTS

5 **Inside Business**

9 **Letters**

11 **Upstarts**

Raster Graphics, Task Technologies and TranSwitch

93 **Executive Viewpoint**

While protectionist bashing may be popular, Americans need to understand better the competitive challenge of the Information Age, according to Intel's director of government affairs, Michael Maibach.

101 **My View**

The war is over

102 **Advertiser index**

108 **Viewpoint**

I want my HDTV

COMPANIES IN THIS ISSUE

98 **An index of the companies covered in this issue.**

EDITORIAL STAFF

Publisher: Frank J. Burge

Editor: Jeffrey Bairstow

Managing Editors: J. William Semich, Roger C. Plant

Senior Editors: Linda Stallmann (Financial), Bruce C. P. Rayner, Rick Whiting, Barbara N. Berkman

Associate Editors: Anthony E. Greene, Michael R. Leibowitz

Assistant Editors: Peter L. Burrows, John McCreadie, Xiong Xiaoge

Section Editor: Marvin V. Greene

Copy Editor: Barbara Jorgensen

Research Editor: Michelle D. Doses

Contributing Editors: Elizabeth Baatz (Cahners Economics), Dwight B. Davis (Boston), H. Garrett DeYoung (Boston), Madeline Franchi (Cahners Economics), Sarah Glazer (Boston), Shohei Kurita (Tokyo)

Consulting Editors: Alberto Socolovsky, Allen Furst

Production Editor: Karen J. Covey

Editorial Assistant: Jean O'Brien

ART STAFF

Art Director: Michael Roach

Associate Art Director: Carla Aguilar Leeder

Staff Artist: Michele G. Kane

EDITORIAL OFFICES

Boston: Cahners Building
275 Washington Street, Newton, Mass. 02158
(617) 964-3030 Telex: 94 0573 CPC BSN
Fax: (617) 558-4327 MCI: EBBOS

Washington, D.C.: Anthony E. Greene
1333 F Street, N.W., Suite 720
Washington, D.C. 20004 (202) 628-2773

San Jose, Calif.: John McCreadie
Sherman Building, 3031 Tisch Way, Suite 100,
San Jose, Calif. 95128 (408) 296-0868

Northwest: Paula Doe
5011 133rd Place SE
Bellevue, Wash. 98006 (206) 641-0903

London: Barbara N. Berkman
27 Paul Street
London EC2A4JU England 011-44-1-628-7030
Fax: 011-44-1-628-5984

PRODUCTION

VP Production: Wayne Hulitzky

Director of Production/Manufacturing: John R. Sanders

Production Supervisor: Andrew A. Jantz

Production Manager: Betsy Harkins; (617) 964-3030

CIRCULATION

Circulation Manager: Ann Ward
44 Cook Street, Denver, Colo. 80206
(303) 388-4511

Total Circulation: 77,804

REPRINTS

ELECTRONIC BUSINESS articles are available on a custom printing basis at reasonable prices. Contact Andrea Marwitz, Cahners Reprint Service, Cahners Plaza, 1350 E. Touhy Ave., P.O. Box 5080, Des Plaines, Ill. 60018 (312) 635-8800
Electronic Business can be purchased on 35mm microfilm through University Microfilm Int. Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich. 48106

Zenith vs. the world

It's David and Goliath all over again in the battle over HDTV. In this 20th century fight to develop industry standards for high-definition systems, Zenith Electronics Corp., the venerable U.S. television manufacturer, has little more than a slingshot to compete with the collaborative might of Japanese and European companies.

Our cover story examines the heated debate in Washington and throughout the electronics industry surrounding the critical issue of how best to proceed with high-definition technology. We also look at Zenith's "Made in the USA" HDTV strategy and its chances for success.

Consulting editor Robert Haavind writes our main story and sets up the arguments: Should there be an all-out, government-assisted program to support high-definition research? Or should the entrepreneurial genius of U.S. electronics producers determine the nation's success or failure in the market? Haavind, the former editor in chief of *High Technology* magazine, writes frequently on U.S. industrial competitiveness.

Whatever the answers, HDTV developments undoubtedly will consume the industry in the 1990s. During this decade and beyond, high-definition systems will render many of today's electronic technologies obsolete and may present the best chance yet for the United States to get back in the global consumer electronics race, Haavind notes.

Assistant editor Peter Burrows focuses on efforts at Zenith to parent the high-definition standard in the United States. Burrows is the newest member of the ELECTRONIC BUSINESS staff and will cover consumer electronics among his beats. He went to Zenith's Glenview, Ill., headquarters and got the story firsthand of the company's sale of its successful computer operation and its strategic efforts to develop HDTV from chairman Jerry Pearlman and consumer president Robert Hansen. It was the first time Zenith's top managers had explained in detail their strategy in selling the systems unit.

Assistant editor Peter Burrows and consulting editor Robert Haavind (in TV screen)

To say that HDTV stakes are high is an understatement. As Haavind points out, HDTV is more than just a new market for U.S.-made television sets. The outcome is crucial for all U.S. electronics manufacturers, Haavind writes. During the next decade, in the semiconductor industry alone, HDTV will double the number of memory chips needed.

MARVIN GREENE, section editor

ELECTRONIC BUSINESS® (ISSN 0163-6197) is published bi-weekly, except monthly in December, by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington Street, Newton, MA 02158-1630. Terrence M. McDermott, President; Frank Sibley, Senior Vice President/General Manager, Boston Division; Jerry D. Neth, Senior Vice President/Publishing Operations; J.J. Walsh, Senior Vice President/Finance; Thomas J. Dellamaria, Senior Vice President/Production and Manufacturing; Ralph Knupp, Vice President/Human Resources. Circulation records are maintained at Cahners Publishing Company, 44 Cook Street, Denver, CO 80206-5800. Telephone: (303)388-4511. Second-class postage paid at Denver, CO 80206-5800 and additional mailing offices. POSTMASTER: Send address corrections to ELECTRONIC BUSINESS® at the Denver address. ELECTRONIC BUSINESS® copyright 1990 by Reed Publishing USA. Ronald G. Segel, Chairman and Chief Executive Officer; Robert L. Krakoff, President and Chief Operating Officer; William M. Platt, Senior Vice President. Annual subscription rates for non-qualified people: USA/Canada/Mexico, $69.95 per year; other countries, $110 per year (including air freight); $210 per year for air mail. Except for special issues where price changes are indicated, single copies of regular issues are available for $10.00 (USA, Canada/Mexico and foreign). Please address all subscription mail to Eric Schmierer, 44 Cook Street, Denver, CO 80206-5800. Cahners Publishing Company, A Division of Reed Publishing USA • Specialized Business Magazines for Building & Construction • Manufacturing • Foodservice & Lodging • Electronics & Computers • Interior Design • Printing • Publishing • Industrial Research & Technology • Health Care • Entertainment • Specialized Consumer Magazines: American Baby • Modern Bride

VBPA ABP

Missed contract directory

Thank you for taking the time to explain about The Contract Manufacturing directory in (Sept. 18) and how you come up with the companies that make up the list. I would like to introduce Circom Inc. and maybe next year be included in your next survey.

Circom Inc. was incorporated in 1968 to provide electronic design and assembly services.

Our information is as follows:

Circom Inc.; 505 W. Main St.; Bentsenville, Ill. 60106; phone (708) 595-4460, fax (708) 595-4615; Alan Rosenberg, Sales Manager; design, product assembly, testing, turnkey manufacturing, cable and harness assembly.

ALAN ROSENBERG
Circom Inc.
Bentsenville, Ill.

The U.S. can compete

Thanks for sending me a copy of your Oct. 16 issue.

There is no question in my mind that if we can provide an adequate fiscal and trade policy, American manufacturers can compete effectively.

PAUL SIMON
United States Senator
Illinois

New accounting methods

I was very surprised none of the companies profiled in your Oct. 16 "Quest for Quality" issue described any new methods of cost accounting. Today's labor-based cost accounting systems are some of the greatest hindrances to quality improvement companies face. Present cost systems track direct labor variances to the minute, but ignore scrap and rework costs entirely. This lack of visibility not only hinders cost reduction programs, but misguides management performance evaluations and capital spending.

On the other hand, a few companies are installing activity-based costing which tracks all costs back to their sources. It does this by allocating overhead costs on measures of activity. Purchasing costs are allocated on purchase orders, warehousing costs on stores issues, and setup costs on production changeovers. This cost system not only pinpoints a company's quality problems, but encourages designers to standardize parts, operators to cut scrap and salesmen to bundle orders.

MICHAEL C. O'GUIN
President
Activity Costing Systems
Huntington Beach, Calif.

Updating Computer Products

Your Oct. 30 article, the "Power supply industry debates the 'bigger is better' issue," mentioned Computer Products Inc. in relationship to past problems.

Since the core of the article centered around the recent aquisition activities of Unitech and BSR International, I feel it was unfair not to update the activities at Computer Products on the same basis:

- The company was restructured and reorganized in mid-1988 under our new chairman and president, John Lemasters. Since the third quarter of 1988, Computer Products has been a profitable company.
- With our restructuring and reorganization in place, we have become the only major power supply company to have consolidated our business on a global basis with streamlined sales, marketing, engineering and operations.
- Our European operation, headquartered in Ireland and established in 1981, is now one of the leading European power supply companies and is extremely well poised for 1992.
- Our Asia-Pacific operation based in Hong Kong is now one of the most modern and efficient power supply facilities in the world, supplying a broad range of power supplies and DC-to-DC converters.

Computer Products is one of the few power supply companies with global capabilities and a global strategy. If our recent results are a predictor of the future, we have both the size and the business focus to be a major force in the world market.

BARRY KELLEHER
President, Power Conversion
Computer Products Inc.
Boca Raton, Fla.

Quality needs support

Congratulations on a beautiful special issue: "Quest for Quality."

I do have a complaint, however. We didn't get a mention for our "Quality Progress" magazine on page 276 of your issue, nor was our show, Quality Expo TIME, mentioned on page 280. QET has been for the past couple of years the largest exclusively quality show in the world.

The quality issue needs everyone's support. Quality is absolutely vital to this country's ability to compete worldwide and your magazine has certainly made a significant statement in this regard.

RICHARD A. TEMPLETON
Vice President/Publisher
Quality Progress
Hitchcock Publishing Co.
Carol Stream, Ill.

Arrow clarification

In our Oct. 30 article, "National distributors tighten their belts," our writing was unclear in portraying Arrow Electronics Inc.'s 1988 profits, in light of its purchase of Kierulff Electronics. We should have been more precise in indicating that Arrow's profits "plummeted" in its fourth quarter of 1987, around the time Kierulff was acquired and not in 1988. The transaction was completed officially in January 1988.

The table below clarifies Arrow's income picture from continuing operations in 1987 and 1988.

Sales and net income figures from continuing operations ($ thousands)

	Sales	Income
1987/1st qtr.	$138,058	$2,978
2nd qtr.	137,723	-2,717
3rd qtr.	142,955	1,162
4th qtr.	143,663	-17,370
FY 1987	**$562,399**	**-$15,947**
1988/1st qtr.	$257,905	$4,005
2nd qtr.	256,511	4,493
3rd qtr.	249,692	1,014
4th qtr.	242,271	226
FY 1988	**$1,006,379**	**$9,738**

Fiscal year ended December 31,

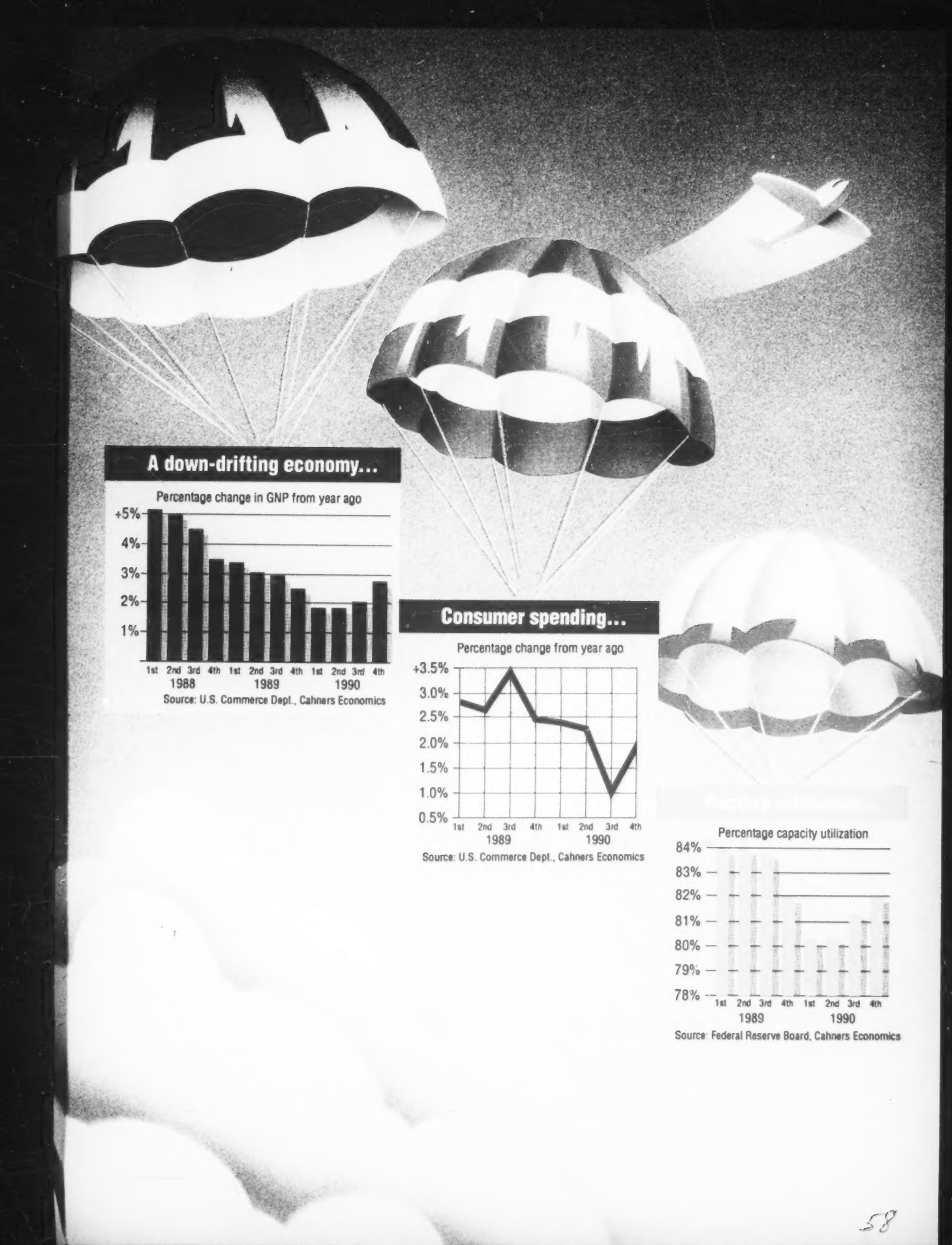
Source: Company reports

Letters to the editor

ELECTRONIC BUSINESS welcomes letters to the editor on any topic of interest to our readers.

ELECTRONIC BUSINESS
Cahners Building
275 Washington St.
Newton, Mass. 02135

Fax: (617) 558-4327
Telex: 94 0573 CPC BSN
MCI: EBBOS



A down-drifting economy...

Source: U.S. Commerce Dept., Cahners Economics

Consumer spending...

Source: U.S. Commerce Dept., Cahners Economics

Source: Federal Reserve Board, Cahners Economics

No crash landing for economy this year

If the Federal Reserve Board can call the right shots and if the dollar behaves itself, 1990's economy will get its long-awaited soft landing — and maybe a gentle takeoff

BY BRUCE C.P. RAYNER

Brace yourself for a lackluster economy this year. Economists are forecasting slow, wobbly and generally unexciting growth for the U.S. economy for most of 1990. Provided there are no unexpected shocks, sluggish business spending, slower export growth and cautious consumers will keep economic activity drifting along slowly. And thanks to that gentle fall, the dreaded recession predicted by several doomsayers will be averted until 1991 or perhaps even until 1992.

"It is fairly probable that 1990 will be a boring year," says Kenneth McGill, senior economist and vice president of the WEFA Group. McGill, like many of his economist brethren, is forecasting annual gross national product growth of about 2.5%, with no recession in sight until possibly 1991. Likewise, the threat of creeping inflation will be beaten back in 1990, he says.

Most inflation forecasts put consumer price index (CPI) growth around 4% for the year, down from 5% in 1989. The Blue Chip Economic Indicators, a consensus forecast of 51 economists, puts GNP growth at 1.7% and the CPI at 4.2% in 1990.

Much of the credit for the predicted soft landing is attributable to the Federal Reserve Board's patient monetary policy. Thanks to Fed chairman Alan Greenspan's insistence on such a posture, inflation is no longer a major worry and short-term interest rates are expected to fall. Cahners Economics, for instance, forecasts that the prime rate will drop to 8.8% this year, from 10.8% in 1989. Adds David Wyss, chief financial economist at Data Resources Inc., "If we have slow growth in 1990, then I think the Fed has bought itself another year of expansion."

Contributing to the resilience of the U.S. economy in 1990 will be the strength of its major trading partners. According to Globescope Publications Inc., an international economic consensus forecaster, the strongest of the trading partners will be Japan, at 4.1% GNP growth, and the five European economies of West Germany, France, Britain, Italy and Spain, at a collective 2.7% growth rate in 1990.

Despite the slow and steady outlook, there are some warning signs that warrant careful monitoring in the coming months. Business debt, corporate profit rates and business inventory levels should be watched. "Vigilance is the watchword, especially in the durable goods area," writes Robert Eggert, editor of the Blue Chip Economic Indicators newsletter.

Growth in business debt looks to be slowing now, particularly after the October 13 stock-market drop of 109 points. Corporate profits have been smaller than expected and could lead to diminished business confidence and lower capital spending.

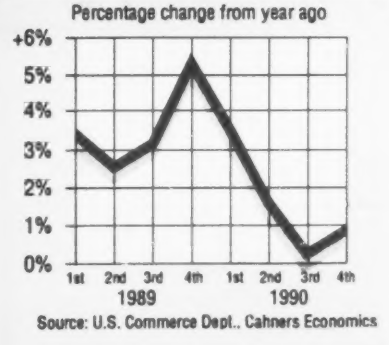
In 1989, after-tax profits fell by an estimated 6.9%, says WEFA's McGill, but they will rise by 4.1% this year. Inventories are expected to rise this year but not at the same pace as the prerecession build-up of 1982.

Consumer debt is of concern, too, but less so than business debt. That's because the savings rate is rising again, after reaching a low of 3.2% in 1987, while installment credit is being spread over a longer period than in the past. Still, the savings rate this year probably won't reach the historic average of 7%.

Greenspan's challenge now is to steer the economy through the murky waters of the slowdown and then propel it into a gentle takeoff. According to many economists, his chances are good, but there are dangers in any fine tuning. And the doomsayers point out that a soft landing has never even happened before, not to mention a slow takeoff.

Still, many economists are confident Greenspan can set the precedent. "I think that what we have now is the kind of monetary policy that may be able to provide the economy with the stability that we have not experienced in the 1970s and the

And business investment



Source: U.S. Commerce Dept., Cahners Economics

Dave Joly

1980s," says Vladi Catto, chief economist with Texas Instruments Inc. But if the economy slows faster and more severely than expected, the Fed might not be able to react quickly enough and a 1990 recession will be inevitable.

Strengthening dollar

There is cause to worry about a recession in 1990, many economists warn. At the top of the list is a strengthening dollar. The strong dollar means more expensive exports and cheaper imports, inevitably leading to a bigger trade deficit.

The implications for a stronger dollar are far-reaching. As demand for exports shrinks, factories slow down and so do capital spending, employment growth and consumer spending. Cahners Economics is forecasting exports of goods and services to post growth of only 4.3% in 1990, down from 10.2% in 1989. Likewise, business fixed investment will grow at a modest 1.7% in 1990, down from 4% in 1989, while consumer spending growth is expected to drop slightly, to 1.8% from 2.75%.

WEFA's McGill doesn't expect the dollar to continue to rise. He forecasts the real exchange rate, as measured by the Morgan Guaranty Trust Co.'s index of 40 currencies, to drop by 1.5% this year after posting a 4% rise in 1989, brought down by declining interest rates. As a result, business fixed investment will post a relatively healthy growth rate of 2.6%.

However, other economists do not paint such a promising picture. Cahners Economics' international economist Kris Bledowski forecasts a falling dollar through the first half of 1990 and then a return to strength toward the end of the year and into 1991. Overall, the year should see a net appreciation for the dollar of 0.2%, he says.

Whether the dollar goes up or down, there is a lag of nine to 18 months before the effects show up in the economy; the 1990 trade balance will be the result of 1989's exchange rates. Bledowski expects the trade balance to widen, from about $120 billion in 1989 to $130 billion in 1990, as merchandise exports rise by only 3% to 5%, compared with an 11% increase in 1989. On the bright side, import growth will slow to 3% in 1990, down from 6.3% in 1989 as the economy cools, he adds. □

Economy drifts down; electronics markets follow

Maturing electronics markets no longer lead the rest of the economy. Like most industry sectors this year, there may be a few hot spots, but most will be cooling off

Although it may not have been true in the 1980s, as the economy goes this year so goes electronics. With a slowing of growth in the gross national product (GNP) in 1990, expect a similar slowdown in the growth rate of the electronics industry.

According to the majority of economists, the Federal Reserve Board will pull the right levers, push the right buttons and the economy will manage its way through the down cycle of activity without experiencing negative growth. Most expect GNP growth of between 1% and 2% for 1990, with activity picking up toward the end of the year.

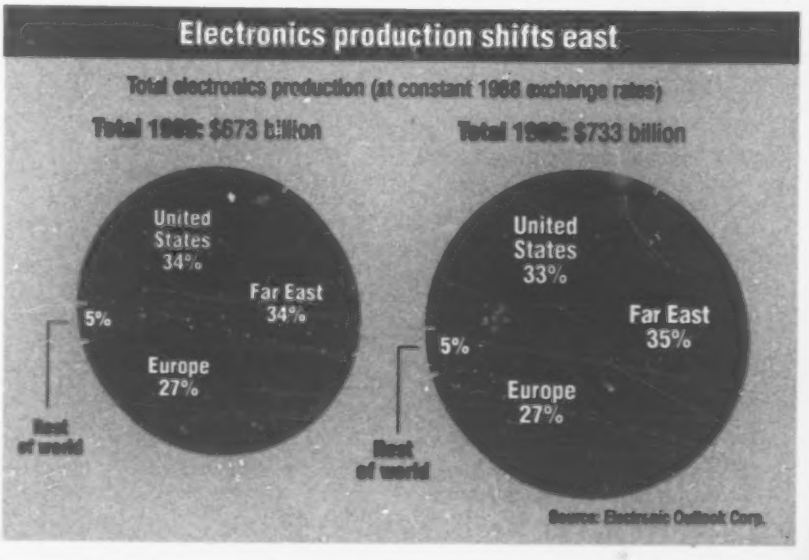
Likewise, slow growth will occur in electronics, possibly with a lag of one or two quarters. The deceleration has a direct impact on the corporate bottom line. According to an ELECTRONIC BUSINESS index, profits in the electronics industry are expected to post meager growth of 1% this year after posting a 3% decline in 1989 and 3% growth in 1988.

Lower profits in turn have consequences for capital spending and consumer spending. Total investment in equipment is forecast to grow by a paltry 2.3% this year in the United States, down from 5.8% in 1989 and 11.5% in 1988. Computer and communications equipment account for about 25% in current dollars of U.S. equipment investment. Overall growth in consumer spending will drop to 1.8% in 1990 from 2.7% last year, according to economist Madeline Franchi of Cahners Economics.

Look for the United States to produce $243 billion worth of electronics equipment this year, up only 2.9% from 1989, says Edward Henderson, president of Henderson Ventures, Los Altos, Calif. That is down from 4.7% last year and 8.2% in 1988.

The world electronics industry, according to Electronic Outlook Corp. in San Francisco, will experience 8.9% growth to $733 billion in 1990.

Japan will grow at just under 10% while the Four Tigers — Hong Kong, Singapore, South Korea and Taiwan — will see growth of around 14.1%,



says Henderson. Even though growth there is somewhat slower than in Europe, the Far East is more significant in real terms, as it will produce products worth $255 billion this year, or 35.6% of the world's electronics production.

Bright spots in segments

As for U.S. market segment growth, there are some bright spots. Cahners Economics expects computer and office equipment shipments to grow by 1.6%, down from 2.7% last year and 10.75% in 1988. Commercial telecommunications equipment will slow to 1.4% growth, compared with 7.7% in 1989; semiconductor sales to the United States and Canada will post 4.7% growth in 1990, down from 10% last year.

The slowdown in growth for computers and semiconductors is compounded because many corporations already made their major hardware purchases back in 1988, and most won't be buying again for a couple of years. There is also the issue of standards, which confuses many would-be purchasers. For example, the debate between the Extended Industry Standard Architecture (EISA), as championed by Compaq Computer Corp. and others, and IBM's proprietary Micro Channel Architecture (MCA) contributes to this confusion.

Meanwhile, robotics will be the laggard in the electronics capital goods market, according to Cahners Economics. Robotics will see a contraction of 2% this year, after posting a healthy growth last year of 62.6%. The industrial sector suffers more severely than other segments because it is tied closely to the ailing auto industry, where the buying cycle lags behind the economic cycle by about 12 months.

The good news is that if the slowdown is put into perspective, it doesn't look nearly as bad. Unlike the 1985-86 industry recession, when wild gyrations in many markets caused major damage to corporate income statements, this year's slowdown will not see much outright dislocation.

Profits in the electronics industry are expected to post meager 1% growth

The reason is a combination of planning and luck. First, 1988, the peak of the last up cycle, was not a boom year. Economic activity didn't spike excessively, so it isn't likely to contract excessively either, says Cahners Economics' Franchi.

For instance, semiconductor sales growth in 1984 was close to 50% over that in 1983, while growth during 1987 and 1988 was a more modest 20% and 30%, respectively. Over the next few years, a muted business cycle will be the norm, adds Franchi.

There are other reasons for only a mild downturn. At the top of the list is improved inventory management. The application of techniques like just-in-time during the last few years has meant companies are not as likely to be caught with excessive inventory overhang during lean times.

Inventory buildup

Still, inventory buildup is inevitable in a soft market. In telecommunications, inventories mounted to an all-time high of $16.8 billion last August, reports In-Stat Inc. a semiconductor market research firm. Similarly, in the computer industry, inventories grew from a low of $10.6 billion in early 1988 to $12.7 billion at the end of last summer. This is still $900 million below the record $13.6 billion hit in 1985, but it is cause for concern, says In-Stat's president Jack Beedle.

Then there is the question of foreign markets. Exports were one of the major drivers during the last recovery and will continue to be so in 1990, albeit at a slower pace. High-tech is a large contributor to exports. For instance, electronics exports in the third quarter of 1989 accounted for 17.5% of total merchandise exports. Increased capital spending in Europe and the Far East, much of which is in electronics, will help spur U.S. exports, many economists say.

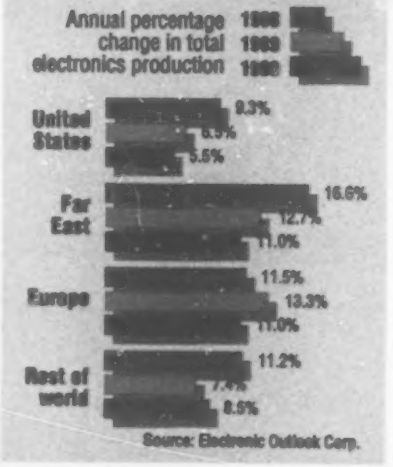
The rising dollar

But the danger of the rising dollar could play havoc with exports. Throughout 1989 the dollar has posted gains against most currencies, pushing up the price of U.S. exports. The question is whether the dollar will continue to rise.

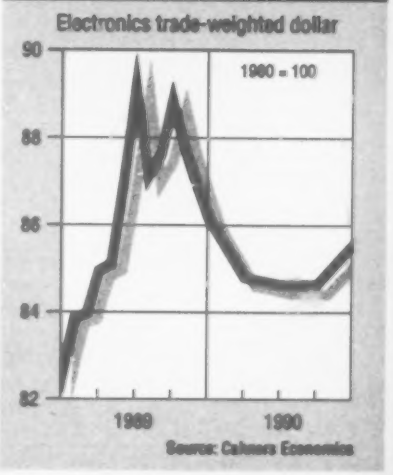
Many economists believe the dollar will depreciate again. That will help boost exports by reducing the comparative price of U.S.-made electronics goods. Cahners Economics expects the electronics trade-weighted dollar — an index of the U.S. dollar weighted according to the value of electronics trade with its major trading partners — to average 84.91 in 1990, down from an average of 86.93 in 1989. Still, the effect of a lower dollar is not expected to have an immediate impact on exports. The lag can be anywhere from six to 24 months, economists say.

Even though the total electronics

Where the growth will be



Dollar declines in 1990



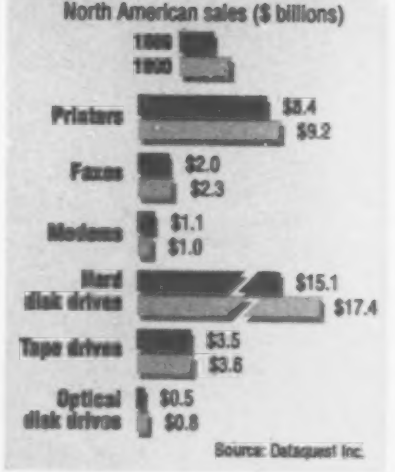
market is forecast to grow slowly this year, several niche markets still hold countercyclical promise. At the same time, some can make an already bleak outlook even worse. What follows is a market-by-market look at where the hot growth will be — and where it won't.

Computers and peripherals: Watch for the continued high growth of the on-line transaction processing market (OLTP). A Hambrecht & Quist Inc. report puts the total 1989 OLTP market at $30 billion, while John Logan, vice president of the Boston-based Aberdeen Group Inc., puts OLTP growth at about 25% in 1990.

Poised to cash in on the growth are companies like Sequent Computer Corp. Sequent has a major share in the $700 million interactive business computer (IBC) market, says Logan. While the interactive market is still a small part of the OLTP segment, it could grow by as much as 35% to 40% during the early 1990s, according to Hambrecht & Quist. The burgeoning IBC market would also signal the long-awaited incorporation of Unix into mainstream business usage.

As for peripherals, optical disk drives will see growth of 100% this year, from $500 million in 1989 to $800 million this year, according to market researcher Dataquest Inc. More importantly, the hard-disk-drive market will post 15% growth this year, from $15.1 billion to $17.4 billion, as demand for storage increases. At the same time, the disk-drive market is undergoing intense price competition and will likely see more consolidation.

Progress for peripherals



Telecommunications: Two areas of telecommunications have good potential for growth in 1990. One is local area networks (LANs) and the other is integrated services digital networks (ISDN). LANs connect office computing systems, while ISDN accelerates long-distance communication of voice, data and video to unheard-of rates. In both areas, fiber-optic cable will see good growth.

LANs have been growing explosively since 1986 and will continue to grow through the economic slowdown this year because of the potential for productivity improvements in the office. Putting individual workstation and personal computer users onto a network means they have quick access to databases and applications.

According to Electronic Trend Publications, Saratoga, Calif., use of LANs of all types will grow at a 22.2% compounded annual growth rate through 1992. The value of LAN shipments was $3.79 billion in 1989 and will grow to $4.47 billion this year, the forecaster says.

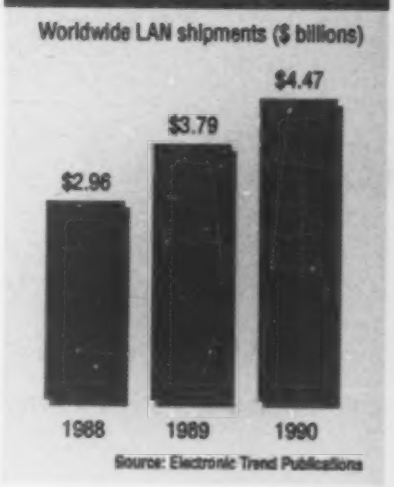
The market for LANs will continue to grow through the economic slowdown

Because of the trend toward distributed computing and the increased departmental demand for data, look for the fiber distributed data interface (FDDI) to take off this year as new chip sets begin to bring the cost of high-performance networking down. FDDI increases bandwidth by a factor of 10 over Ethernet.

In the budding ISDN market, look for local exchange carriers to offer networks for business clients, primarily in the retail and financial sectors. Also, watch for MCI to start its phased rollout of ISDN, joining the ranks of AT&T and U.S. Sprint, says H. Paris Burstyn, director of telecommunications research and consulting at the Business Research Group, based in Newton, Mass.

Consumer electronics: 1990 will not be a good year for consumer electronics in the United States. Domestic production of consumer durables — mainly autos and appliances, both of which have a growing electronics content — is projected to contract this year by 1.5%. The bottom of the trough is expected to be next quarter when consumer durables will post negative growth of 3.3%, according to Cahners Economics. The fourth quarter will see a return to positive growth.

LANs keep on growing



Within consumer durables, U.S. television and radio production is expected to see positive growth this year of 1.44%, down from 5.7% last year, forecasts Cahners. By 1991, the TV and radio sector will rebound to 4.6% growth.

Semiconductors: This year will not be a good one for the semiconductor industry. In-Stat is forecasting U.S. consumption of all integrated circuits, including discrete devices, will decline by 1.9% to $14.7 billion this year, from $15 billion in 1989 — a far cry from the 30.8% growth ICs posted in 1988.

The culprit is a slowdown in the demand for computers. The computer market still accounts for more than 40% of the domestic consumption of chips. Capacity in 1 megabit dynamic RAM facilities around the world currently is running about 60%, reports In-Stat's Beedle. Toshiba, Hitachi and Samsung are all cutting back production and it will be a while before 4Mb DRAMs become price-competitive.

A hot semiconductor market worth watching, however, is mixed analog

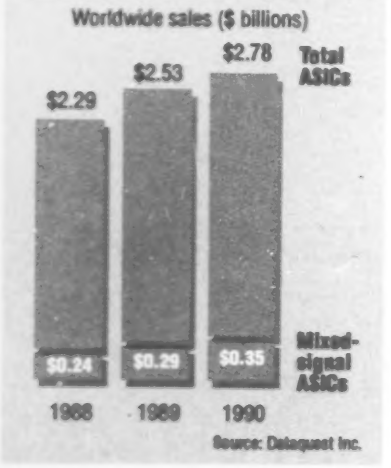
and digital application-specific integrated circuits. Dataquest projects compounded growth of 21.4% through the early 1990s in mixed-signal ASICs. From $240 million in 1988, the market will hit $350 million in 1990. Demand is strong, thanks to a need to reduce board space, increase reliability and lower costs.

Capital, test and industrial equipment: Like semiconductors, don't expect much activity here. Worldwide semiconductor equipment — a major component of capital spending in electronics — is forecast to drop from $9.6 billion in 1989 to $8.4 billion in 1990, says Robert Frizzell, senior analyst at VLSI Research Inc., in San Jose.

Semiconductor makers bought production equipment heavily in 1988 in preparation for the 1Mb DRAM ramp up and won't be in need of replacements until the 16Mb DRAMs come along. The only saving grace might be a pick-up in European investment, says Frizzell.

Likewise, test and measurement equipment will grow by only 4.9% in 1990, down from 8.3% last year, according to Henderson Ventures, because of the slowdown in the computer and telecommunications markets. Still, one high-growth area will be mixed-signal analog and digital testers, according to Carolyn Rogers, a technology analyst at Hambrecht & Quist. Growth here could top 10% in 1990, Rogers says, with Teradyne Inc. capturing an increasing share of the market.

Mixed-signal ASICs advance



In the area of industrial automation, the slowdown will be just as certain. Tak Shiraki, vice president of Panasonic Factory Automation Co., Franklin Park, Ill., admits that business is already slowing down gradually.

But according to the Robotic Industries Association (RIA), the demand for robots is spreading outside Detroit and making its presence felt in the computer, aerospace and appliance industries. Because of the broadening base, robotics posted a growth of about 30% in 1989, from $307 million in 1988 to an estimated $400 million in 1989, according to the RIA. Last year was the first year of solid growth for five years, says analyst Henderson. Expect the industry to grow by around 10% in 1990.

Defense: When peace breaks out, the defense industry is the place not to be. Even though Congress approved a much reduced $286 billion budget for fiscal year 1990, Secretary of Defense Richard Cheney is now discussing significant reductions in military spending for 1991 — maybe as much as 10% from 1990's level — partly in response to the dramatic changes going on in Eastern Europe. At the same time, the Pentagon is said to be studying ways to cut another $180 billion from its budget between 1992 and 1995.

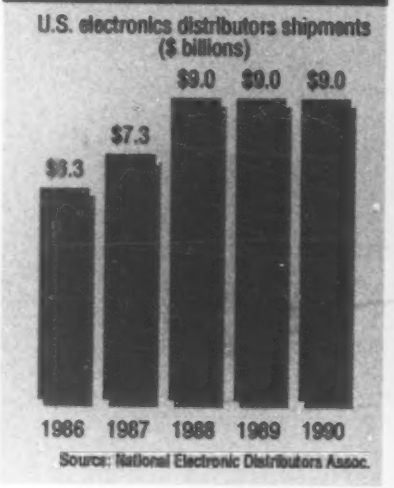
When peace breaks out, the defense industry is the place not to be

Cahners Economics projects defense and space production will contract by 4.5% this year after a similar contraction of 3.2% in 1989 and 1.5% in 1988.

That means defense electronics will suffer spending cuts, too. This year's budget calls for lower spending levels on the strategic defense initiative, the V-22 Osprey tilt-rotor aircraft and the advanced tactical fighter. At the same time, there is talk of cutting back production schedules for the B-2 bomber in 1991 and beyond. All of these programs have a high electronics content.

About the only bright spot is in surveillance and reconnaissance, as the United States gears up for the confirmation of a START treaty some time in the next few years. Prime contractors such as Lockheed Corp. and TRW Inc. could be big winners in this arena, as they both have significant satellite operations.

Zero growth for distributors



Distribution: When the electronics industry is up, distributors cash in, but when the industry is down, they tend to starve. So it should come as no surprise that the National Electronic Distributors Association is projecting zero growth for the $9 billion distribution market this year, after an identical forecast for 1989. The most successful will be those distributors that specialize in a niche. Successful niche players like Kent Electronics Inc., in the passives market, and Anthem Electronics Inc., in semiconductors, will continue to outpace the market.

Soft markets are prime time for strong players to prowl for acquisitions, so watch for continued consolidation. Arrow Electronics Inc. recently made another acquisition in Britain and Avnet Inc. is also expanding in Europe. Watch for the Brits to expand on this side of the Atlantic, too.

Competitive pressure will continue to exert downward pressure on gross margins forcing many distributors to cut costs. Some of the big distributors are eliminating some of their branch offices, Avnet included, and renewed attention is being devoted to improving the quality of service.

BRUCE C.P. RAYNER

Venture capitalists nourishing only the best and brightest

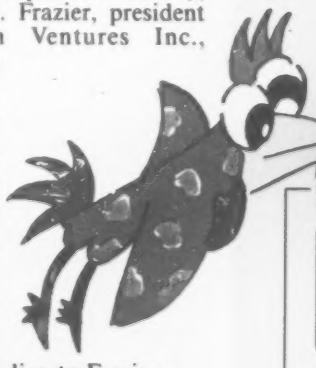
To succeed in raising seed money, high-tech entrepreneurs must supply innovative products directed at solving specific customer problems. It helps to hit the ground running

BY RAY WISE

Venture capitalists over the last year and a half or so have become highly selective in feeding funds to early-stage high-tech projects. They strongly prefer products aimed with great precision at solving specific customer problems, and much of the investing is in software. Hardware stirs little enthusiasm today in the venture-capital community, unless it is intensely focused — although medical technology is gaining favor.

"Everybody in this business has grown more cautious in making investments," says Jon W. Bayless, a general partner of SRB Management Co. in Dallas. Adds Rick Burnes of Charles River Ventures in Boston, "The screen has become tighter. We are seeing a lot of entrepreneurs who are having trouble raising money."

One reason for the venture capitalists' caution is that the cost of nurturing a fledgling high-tech enterprise has climbed sharply, and paybacks have not kept pace. A company that might have cost $1 million or $2 million to start in 1979 required $5 million by 1984; the same company now would require $25 million, figures Diana H. Frazier, president of BancBoston Ventures Inc., Boston. Because investment returns are down, Frazier has turned her back on all but the most promising high-tech ventures. "To be successful, an emerging company has to be up and running like a colt," according to Frazier.



The situation is especially acute in the computer sector. "There has been an enormous escalation in the cost of starting up a computer company, so the company must perform incredibly well to pay back its investors," says Rick Fluegel of Matrix Partners in Menlo Park, Calif.

Moreover, software development has not kept abreast of advances in hardware, posing a big stumbling block for the design of a general-purpose computer. Hardware representing a quantum improvement in technology would probably lack the software needed to run it. "You have got to have a breakthrough in technology," says G. Bickley Stevens of Eastech Management Co. Inc. in Boston, "and one that will handle established software."

Crowded hardware market

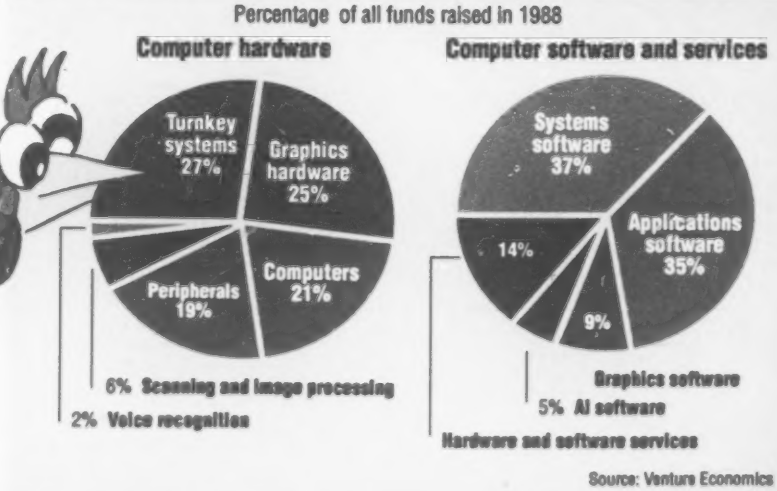
The impact of this technology lag is exacerbated by crowding in the hardware marketplace, which serves to shorten product life cycles. "We are being very cautious about investing in general-purpose computers," says DuBose Montgomery of Menlo Ventures in Menlo Park, Calif. "We are not going to finance the 57th workstation, PC or minisupercomputer." Says SRB's Bayless: "It is hard to see where there would be an unserved market in computer hardware."

Yet such highly specialized products as turnkey systems and graphics hardware draw plenty of attention and funding from venture capitalists, according to Venture Economics Inc. in Needham, Mass., a firm that tracks the venture-capital industry. In fact, turnkey systems — hardware and software bundled for industry-specific applications, such as office automation and retailing — had the most venture-capital support of any hardware category last year.

These systems accounted for 27% of all funds raised in 1988, up a sharp 19% over 1987. Graphics hardware, which includes computer-aided de-

Computer hardware and software financing

Percentage of all funds raised in 1988



Source: Venture Economics

sign, manufacturing and engineering (CAD/CAM/CAE) systems, garnered 25% of the funds raised in 1988, up 2% from the year before. These were the only two computer hardware categories tracked by Venture Economics that chalked up year-to-year gains in financing.

"The focus is on products that are truly unique," says Pierre Lamond of Sequoia Capital in Menlo Park, Calif. "In the past we have had too much duplication, too many disk-drive and supercomputer companies. I welcome the increased selectivity."

"Five years ago," says Shirley Cerrudo of Burr, Egan, Deleage & Co. in San Francisco, "it was important for the entrepreneur to do marketing well. Now high tech is solution-driven."

Venture capitalists advise entrepreneurs developing ideas in this environment to focus on solving well-defined problems for the end user. Montgomery of Menlo Ventures favors products promising competitive "hard-dollar paybacks" to customers. For example, if competing systems pay for themselves in 12 months, Montgomery would want to back a venture that will pay for itself in half that time.

"Our interests lie where there are niches," adds Tom Stark, vice president in the Boston office of 3i Ventures Corp.

A few niches other than turnkey systems and graphics still beckon in hardware, and connectivity is prominent among them. Because mainframe users rarely scrap the expensive machines, they often find themselves owning an eclectic array of mainframes and desktop computers that need to be linked.

Innovative hardware packaging, such as notebook-sized computers, is another fertile area for entrepreneurs, according to Andrew Fillat of Advent International Corp. in Boston. These specialized applications usually require custom-designed or near-custom semiconductors, Fillat points out. "You have to build silicon from the ground up," he says.

Specialized medical technology is also arousing interest among such venture capitalists as Allan Ferguson, senior vice president of 3i Ventures. "Diagnostic and monitoring equipment is an area where we are seeing more and more business plans," he reports. "These instruments are used in the physician's office or in the home, rather than in the hospital." Among the new medical applications are the monitoring of glucose, cholesterol and triglyceride levels.

Computer software can still stir up excitement in the venture-capital industry, as well. Says Cerrudo of Burr, Egan, Deleage, software's longer product life cycle and its less severe cost escalation, relative to hardware, makes it attractive. Cerrudo's theory is that creation of a new software product is a slow, painstaking process because the programmer must still put one foot in front of the other. "You can't throw twice as much money at software and expect to finish it in half the time," she says.

"I don't think the product life cycle is shrinking as fast in the software business as it is in hardware," adds Steven Bird, vice president of First Century Partners in Menlo Park, Calif. Bird's quest is for "well-differentiated software."

"Software is behind the hardware," Charles River Ventures' Burnes says. "It is going to change a lot over the next 10 years and provide plenty of investment opportunities," he adds, citing systems software, database

software and tools. Systems software had a banner year in 1988, snaring 37% of all funds raised in the software and computer services sector, up from 30% the year before.

Software surge

The surge in software investment reflects the efforts of software engineers to speed up the development of their products and close the gap with hardware, according to Venture Economics. Increasingly, engineers are turning out systems software in the form of program-development tools.

Cerrudo is hooked on some specific software areas she thinks are promising. "There are very few mid-sized companies creating software based on Unix," she says. "That is something very interesting. There are no distributors of Unix-based software to speak of, either." Cerrudo also favors groupware — "software optimized for networking in a multiuser, multitask environment." Another underserved marketplace, she says, is object-oriented databases.

First Century's Bird has a decided preference for mainframe, minicomputer and workstation software and increasingly is turned off by programs written for personal computers, which he views as being too close to commodities. There are more than 100 personal computer accounting packages on the market, Bird estimates, many of them barely distinguishable from one another. Higher-end software costs between $50,000 and $500,000, he says, and requires maintenance and consulting services that generate revenue streams.

Much of the high-end software is distributed by direct sales forces, but below some price point, this is not economically feasible. "Selling expenses become high in relation to the price of the software," says Bird, who thinks the price breakpoint is somewhere between $50,000 and $100,000. With salespeople costing about $200,000 each per year, this is a big issue confronting the software industry, one that helps Bird select entrepreneurs to finance. He seeks management teams combining technical prowess with "an understanding of the sales and marketing issues confronting the software business."

The cost of nurturing a fledgling high-tech enterprise has climbed sharply

In the last analysis, the quality of a management team is what first arouses a venture capitalist's interest, reflecting the widespread belief in the industry that a company can succeed without a strong product, but not without strong management. Experience counts heavily when such firms as Matrix Partners decide where to allocate venture capital. Michael Humphreys of Matrix's Boston office seeks "people with demonstrated success, preferably in the form of a 10-year track record with a computer or semiconductor company," he says.

SRB's Bayless looks for entrepreneurs "who have a fast track record, high energy, a high IQ and a sense of urgency about getting things done." Adds Matrix's Fluegel, "The CEO should be somebody who has had profit and loss responsibility."

Ferguson and Stark of 3i Ventures Corp. try to weed out would-be entrepreneurs who write business plans only as outlets for their disenchantment with their jobs.

Cerrudo prepares entrepreneurs for the possibility that they may have to sell out rather than take their ventures public. Bayless goes further — he won't back a company unless he thinks it can generate $50 million to $100 million in revenue within five to seven years and then sell stock to the public.

In today's highly demanding venture-capital environment, Advent International's Fillat says, the challenge to aspiring entrepreneurs is quite clear: "Identify a real problem and find a real solution to it." □

Synergy Semiconductor: No trouble finding capital

Synergy Semiconductor Corp. in Santa Clara, Calif., whose list of venture capitalists reads like a *Who's Who* in the industry, clearly illustrates the kind of enterprise capable of luring investment in today's tough marketplace.

Driven by a team of seasoned founders, Synergy hit the ground running. It pursued a clearly focused niche: creating and making ultrafast memory and logic products using bipolar emitter-coupled logic (ECL) technology [ELECTRONIC BUSINESS, July 24, 1989.]

Founded in February 1987, Synergy within six months had garnered $3.85 million in first-round financing and selected its president and CEO, Kenneth Wolf, a 25-year semiconductor veteran. Wolf's management team includes Synergy's five "founding fathers," whose combined experience in the industry totals 110 years.

In December 1987 Synergy acquired a used fabrication line housed in a 50,000-square-foot office and foundry complex, where it began applying its proprietary manufacturing process. Second-round financing of $9.2 million was obtained in February 1988, and less than a year later the company's first high-speed memory product made its debut. Synergy has 78 employees, more than half of them engineers.

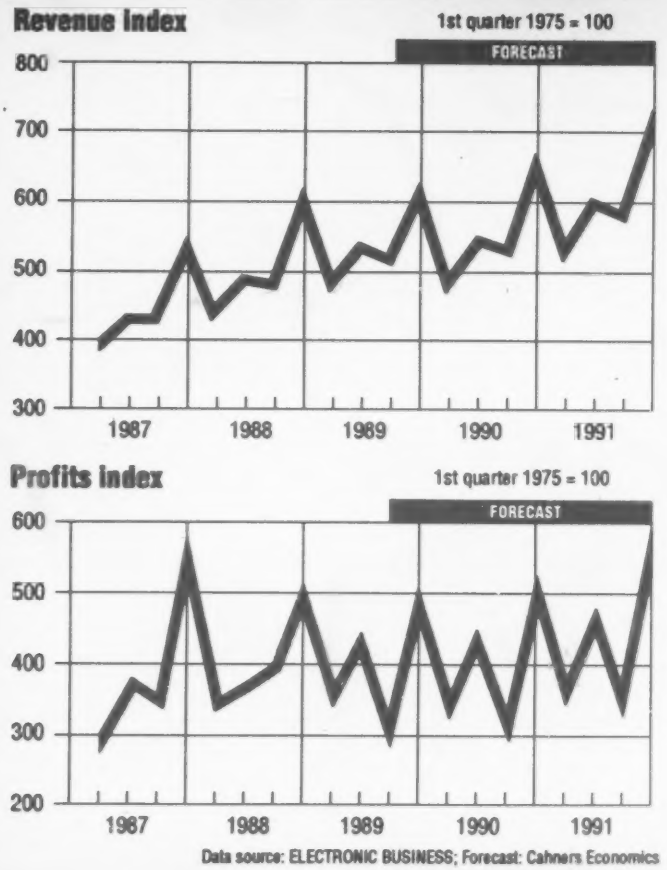
Focusing on performance

Ralph Cognac, vice president for marketing and sales, notes that the strong momentum of Synergy's start-up reflects its unwavering concentration on the high-performance semiconductor market that has emerged from the "MIPS race."

"A personal computer is obsolete the day you bring it out, because by then someone has built a faster one," Cognac says.

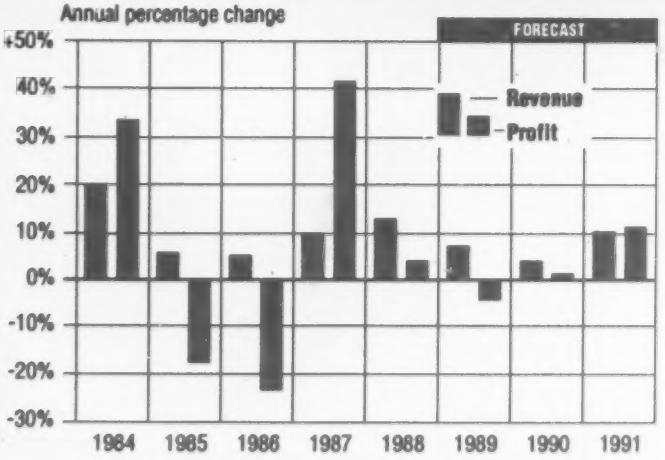
A lot of venture capitalists seem to sanction Synergy's stress on speed. Mayfield Fund and Sequoia Capital, both of Menlo Park, Calif., were major investors in Synergy's first-round financing. They were joined in the second round by Menlo Ventures, also of Menlo Park; Merrill, Pickard, Anderson & Eyre in Palo Alto, Calif.; Oak Investment Partners in Westport, Conn.; and J.H. Whitney & Co. in New York City, among others. □

ELECTRONIC BUSINESS indexes



Data source: ELECTRONIC BUSINESS; Forecast: Cahners Economics

Profit and revenue growth



Data source: ELECTRONIC BUSINESS; Forecast: Cahners Economics

Electronics profits dive in third quarter of '89

The ELECTRONIC BUSINESS profit index took a turn for the worse in the third quarter of 1989, setting the stage for an expected 2.5% decline in profits by the end of the year. An 18% surge in profits in the second quarter of 1989 over the year-ago quarter was more than offset by a dismal 25% drop in the third quarter. In the final quarter of 1989, Cahners Economics expects the ELECTRONIC BUSINESS profit index to fall again to 2% below year-ago levels.

Of the representative 15 companies which compose the ELECTRONIC BUSINESS index, two-thirds saw profits shrink from year-ago levels in the third quarter of 1989. Only three companies, however, actually were in the red. The profit performance last summer was not as bad as the ELECTRONIC BUSINESS profit index suggests. Declining profits at IBM and Digital Equipment Corp. accounted for over 80% of the decline in the ELECTRONIC BUSINESS profit index.

Some companies such as Hewlett-Packard Co. fared better in the third-quarter profits. As a broad-based company with revenue from personal computers, workstations, peripherals and services, HP is somewhat protected by the swings in the computer industry business cycle. Still, the bottom line in 1990 will be driven not by continued strong revenue growth, but by cost containment, even for the broadest companies.

The worst quarterly profit declines may well be over soon, if Cahners Economics' forecasts hold true. Despite continued sluggishness in electronic component and equipment shipments, profits are expected to hold relatively steady with a 1.5% gain in 1989. Cost-cutting, strict inventory controls and growing foreign revenue should help prop up the bottom line. In 1990, profits are likely to surge ahead at a double-digit pace once again.

Without stronger profit gains in the year ahead, however, Wall Street will continue to look at technology stocks with a jaded eye. As too many firms continue to chase too few customers and as the industry adjusts to more mature markets, consolidation will continue vigorously throughout the next year.

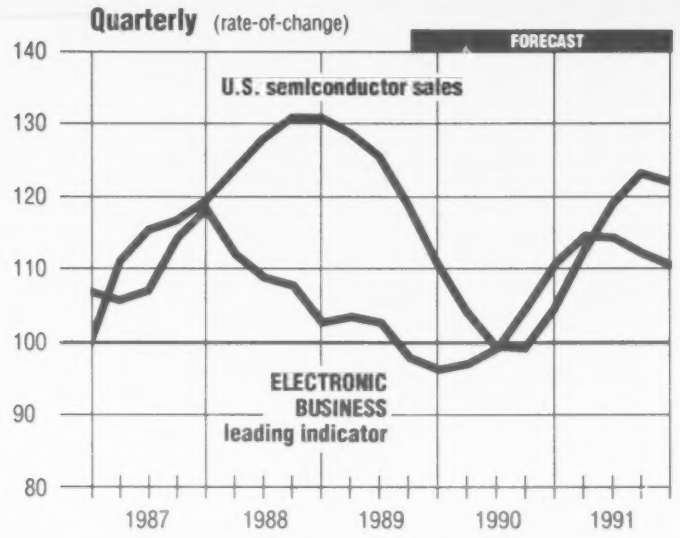
ELIZABETH B. BAATZ, Cahners Economics

For more information about Cahners Economics and its electronics industry forecasts, please write Dan Buchan, Cahners Economics, Newton, MA 02158-1630, or call 617-558-4758 or telefax 617-558-4402.

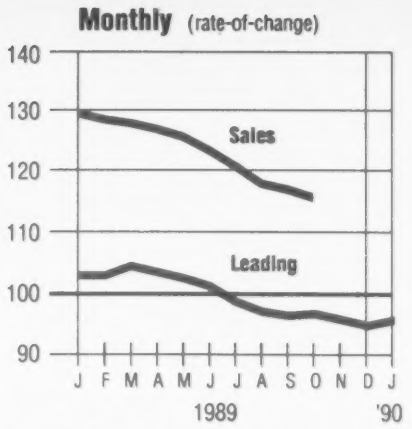
BUSINESS BAROMETER

FORECASTS FOR ELECTRONICS, COMPUTERS AND SYSTEMS

ELECTRONIC BUSINESS leading indicator



The ELECTRONIC BUSINESS leading indicator predicts turning points in U.S. semiconductor sales with about a three- to nine-month leadtime. For more information please contact Elizabeth Baatz, senior economist, Cahners Publishing Co., 275 Washington St., Newton, Mass., 02158, or call (617) 558-4368



The ELECTRONIC BUSINESS leading indicator continued falling to 96.6 this past September. Partial data in October suggests that the indicator may be stabilizing or heading up slightly, however it is expected to trough at 95.0 soon. Expect the short and shallow downturn we've been predicting to materialize in mid-1990 for semiconductors and late-1990 for electronics equipment.

Source: Cahners Economics

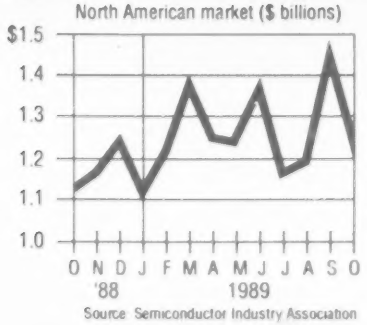
Electronics industry indicators this month

	Latest month	Previous month	Year ago	1988 average
ELECTRONIC BUSINESS leading indicator (rate-of-change, Sept.)	96.6	97.2	105.5	107.6
U.S. semiconductor bookings ($ millions, 3-month average, Oct.)	$1,194	$1,153	$1,114	$1,178
Weekly hours of semiconductor production workers (monthly average, Sept.)	40.2	39.7	39.9	40.2
Electronic components leadtime index (1977 = 100, Nov.)	94.2	75.4	100.0	108.9
S&P's semiconductor stock price index (1970 =10, monthly average, Oct.)	58.7	58.0	48.1	54.4
Change in electronic components inventories ($ millions, SA, Sept..)	-$82	+$90	+$61	+$80
Contracts and orders for plant and equipment ($ billions, SA, Sept.)	$40.4	$41.7	$39.1	$39.7

SA = seasonally adjusted, all other data is not seasonally adjusted

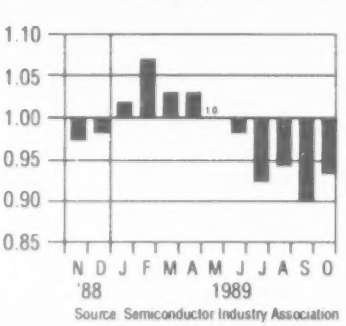
Sources: Semiconductor Industry Association, U.S. Bureau of Labor Statistics, *Electronics Purchasing* magazine, Standard & Poor's, U.S. Commerce Department, U.S. Bureau of Economic Analysis

Semiconductor sales



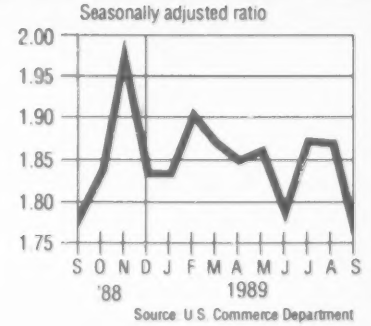
Source: Semiconductor Industry Association

Semiconductor book-to-bill ratio



Source: Semiconductor Industry Association

Component inventory-to-shipments



Source: U.S. Commerce Department